

REMARKS

The Office Action dated January 24, 2005 has been received and carefully noted.

In accordance with the foregoing, claim 1 has been amended to resolve a minor typographical error. No new matter is being presented, and approval and entry are respectfully requested. As will be discussed below, it is also requested that all of the pending claims be found allowable as reciting patentable subject matter.

The Applicants wish to thank Examiner Duong for indicating allowable subject matter in claims 1-3, 6-13, 21-23, and 26-33. Claims 19, 20, 39, and 40 stand objected to as being dependent upon a rejected based claim, but would otherwise be allowable. Claims 14-17 and 34-37 stand rejected.

Claims 1-3, 6-17, 19-23, 26-27, 39, and 40 are pending and under consideration.

REJECTION UNDER 35 U.S.C. § 102:

In the Office Action, at page 2, claims 14-16 and 34-36 were rejected under 35 U.S.C. § 102 as being anticipated by U. S. Patent No. 5,331,637 to Francis et al. ("Francis"). The Office Action took the position that Francis describes all the recitations of claims 14-16 and 34-36. This rejection is traversed and reconsideration is requested.

Independent claim 14, upon which claims 15-17 and 19-20 are dependent, recites a method for forwarding multicast packets in a network comprising a plurality of routers in a multicast group. Each of the plurality of routers reports routing tree information to

other routers of the plurality of routers. The method includes receiving a multicast packet at a second router, the multicast packet transmit from a first router and including control information, wherein a multicast packet is from a selected source and for a selected multicast group, and determining, based at least in part on the control information and the routing tree information reported by the first router, if the multicast packet is to be forwarded by the second router. In response to a positive determination that the multicast packet is to be forwarded in the step of determining, the method forwards the multicast packet from the second router to at least a third router and creating an entry in a multicast forwarding cache. The entry indicates that a multicast packet from the selected source and the selected multicast group should be forwarded from the second router.

Independent claim 34, upon which claims 35-37 and 39-40 are dependent, recites an apparatus for forwarding multicast packets in a network including a plurality of routers in a multicast group, wherein each of the plurality of routers reports control information including routing tree information to other routers of the plurality of routers. The apparatus includes a first router including a multicast forwarding cache. The first router, further for receiving a multicast packet from a second router in a network, the multicast packet from a selected source and for a selected multicast group, determining, based at least in part, on the control information and the routing tree information reported by the second router to the first router, if the multicast packet is to be forwarded by the first router. The first router, in response to a positive determination that the multicast packet is to be forwarded, forwards the multicast packet to at least a third router. The

first router creates an entry indicating that a multicast packet from the selected source and the selected multicast group should be forwarded after making a positive determination that the multicast packet is to be forwarded.

As will be discussed below, Francis fails to teach or suggest the elements of any of the presently pending claims.

Francis generally describes a method for routing multicast packets in a network. All nodes according to Francis maintain a state indicating whether or not they are on a particular multicast tree of each multicast group. See column 7, lines 48-62. Thus, initially, a node r107 is the only node with a state indicating that it is on the multicast tree associated with the aforementioned particular multicast group. As nodes join the multicast group, branches are formed leading from a node currently on the multicast tree to each node joining the group.

However, instead of forwarding multicast packets in a same network, Francis provides a host node s101 communicating a request to join the particular multicast group to a designated router, r101. See column 8, lines 3-5. Francis provides that nodes r101, r102, and r104 are not part of the multicast tree of the multicast group that the host node s101 wishes to join. The routers recited in independent claims 14 (i.e., first router, second router, and third router) are part of “a network comprising a plurality of routers in a multicast group.”

In addition, in Francis, in response to detecting a request by a source node s101 to join a particular multicast group, the router r101 generates a join request control packet

containing the multicast address of the node r107 in the destination address field of the packet and a join request message. See column 8, lines 1-13. However, the join request control packet of Francis is not a multicast packet, where the multicast packet “is from a selected source and for a selected multicast group,” as recited in independent claim 14. Francis specifically describes that the node r101 is not yet on the multicast tree of the multicast group which a node s101 wishes to join. See column 8, lines 14-32. The node r101 may illustratively consult a directory to determine the multicast address of the node r107 if not already known. Thus, the node r101 changes its state to indicate that it is in the process of being added to a multicast tree of the multicast group that the node s101 wishes to join.

In addition, the directory of Francis does not teach or suggest the determination features recited in independent claim 14. Specifically, Francis fails to teach or suggest, “determining, based at least in part on said control information and the routing tree information reported by said first router, if said multicast packet is to be forwarded by said second router,” as recited in independent claim 14. Instead, in Francis, a unicast table is consulted to determine a next node. See column 8, lines 19-23. The node r101 then writes the address of previous node, the node s101, and the next node, r102, in a forwarding table and then transmits the join request control packet to the next node r102. Francis does not teach or suggest that the determination is made based in part on routing tree information reported by the first router, r101. Instead, the unicast table is used.

Also, in Francis, the node r101 determines the next node on the path to the core node r107, e.g., by retrieving from a unicast forwarding table (not shown) maintained at the node r101 the entry indexed by the multicast address of the core node r107. There is no determination in Francis of the next node based at least in part on control information and routing tree information reported by a first router, r101. Francis does not provide a description or suggestion that routing tree information is used, along with the join request control packet, to determine the next node. Francis. In addition, Francis generally describes in FIG. 7 a forwarding table entry which maps the next nodes with respect to an index. However, the forwarding table does not provide that the forwarding is based on the control information and the routing tree information reported by the first router.

Furthermore, Francis does not teach or suggest that the entry in the unicast table or the forwarding table include an “entry indicating that a multicast packet from said selected source and said selected multicast group should be forwarded from said second router,” as recited in independent claim 14. Instead of forwarding multicast packets in a network, Francis provides of a host node s101 communicating a request to join the particular multicast group. See column 8, lines 3-5. Accordingly, Francis fails to teach or suggest all the recitations of independent claim 14.

Because independent claim 34 includes similar claim features as those recited in independent claim 14, although of different scope, and because the Office Action refers to similar portions of the cited references to reject independent claim 34, the arguments

presented above supporting the patentability of independent claim 14 are incorporated herein to support the patentability of independent claim 34.

Accordingly, in view of the foregoing, it is respectfully requested that independent claims 14 and 34 and related dependent claims be allowed.

REJECTION UNDER 35 U.S.C. § 103:

In the Office Action, at page 3, claims 17 and 37 were rejected under 35 U.S.C. § 103 as being unpatentable over Francis in view of U. S. Patent No. 6,778,532 to Akahane et al. ("Akahane"). The Office Action took the position that Francis and Akahane describe all the recitations of claims 17 and 37. The rejection is traversed and reconsideration is requested.

As will be discussed below, Francis and Akahane fail to teach or suggest the elements of any of the presently pending claims.

Dependent claim 17 depends from independent claim 14 and recites the additional features of "wherein said multicast packet includes a time value, wherein said time value is used to limit the time said multicast packet is allowed to remain in the network." In addition, dependent claim 37 depends from independent claim 34 and recites the additional feature of "wherein said multicast packet includes a time value, wherein said time value is used to limit the time said multicast packet is allowed to remain in the system." Because the combination of Francis and Akahane must teach, individually or combined, all the recitations of the base claim and any intervening claims of dependent

claims 17 and 37, the arguments presented above supporting the patentability of independent claims 14 and 34 over Francis are incorporated herein.

Akahane generally describes a method for speeding up a multicast packet route search process during the relay process for a multicast packet. See column 5, lines 20-23. A route address is formed by coupling a receiver address and a sender address in this order; one p -th power-of-2-branch tree node is configured by a collection of one two-branch tree node and two-branch tree nodes of $p-1$ stages totaling $((p\text{-th power of } 2)-1)$ nodes just under the one two-branch tree node to form a p -th power-of-2-branch tree which is stored in a memory; not one bit but consecutive p bits of the route address coupling the receiver address and sender address in a received multicast packet in this order are checked at the same time; and in accordance with the values of the consecutive bits, a search tree stored in the memory is searched. See column 5, lines 50-67. In this manner, a search process can be completed by tracing nodes (the number of bits of a search key divided by p) times at a maximum, independently from the number of entries.

However, similarly to Francis, Akahane fails to teach or suggest, “determining, based at least in part on said control information and the routing tree information reported by said first router, if said multicast packet is to be forwarded by said second router,” as recited in independent claim 14. Akahane focuses in improving the searching speed in a multicast route, but does not teach or suggest the determination features recited in independent claim 14 of being based on at least control information and routing tree information. Thus, a combination of Francis and Akahane fails to teach or suggest all the

recitations of independent claim 14. For similar reasons, Francis and Akahane fail to teach or suggest all the recitations of independent claim 34.

Accordingly, in view of the foregoing, it is respectfully requested that independent claims 14 and 34 and related dependent claims 17 and 37, respectively, be allowed.

CONCLUSION:


In view of the above, Applicants respectfully submit that the claimed invention recites subject matter which is neither disclosed nor suggested in the cited prior art. Applicants further submit that the subject matter is more than sufficient to render the claimed invention unobvious to a person of skill in the art. Applicants therefore respectfully request that each of claims 14-17 and 34-37 be found allowable and, along with allowed claims 1-3, 6-13, 21-23, and 26-33, this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the Applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the Applicants respectfully petition for an appropriate extension of time.

Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,


Alicia M. Choi
Registration No. 46,621

Customer No. 32294
SQUIRE, SANDERS & DEMPSEY LLP
14TH Floor
8000 Towers Crescent Drive
Tysons Corner, Virginia 22182-2700
Telephone: 703-720-7800
Fax: 703-720-7802

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